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Widmer et al.

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(54) **SYSTEMS, METHODS, AND APPARATUS FOR DETECTION OF METAL OBJECTS IN A PREDETERMINED SPACE**

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See application file for complete search history.

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(57) **ABSTRACT**

This disclosure provides systems, methods and apparatus for detecting foreign objects. In one aspect an apparatus for detecting a presence of an object in a magnetic field is provided. The apparatus includes a power circuit configured to generate the magnetic field and transfer power wirelessly at a level sufficient to power or charge a load via the magnetic field. The apparatus further includes a detection circuit configured to transmit signals and detect, based on a reflection of the transmitted signals, a frequency of vibration of the object caused by the magnetic field.

27 Claims, 32 Drawing Sheets